CLAIMS

What is claimed is:

1. A threat launch detection system, comprising:

at least one temporal threat detector, each temporal threat detector including a single sensing element operable to sense radiation from various types of short-burn threats that occur within a field of view of the detector and to generate a detection signal in response to the sensed radiation; and

a processing circuit coupled to each temporal threat detector and operable to analyze the detection signal from each temporal threat detector as a function of time to detect the occurrence of a short-burn threat within the field of view of any of the temporal threat detectors.

2. The threat launch detection system of claim 1 wherein each temporal threat detector comprises a prism-coupled compound parabolic concentrator.

3. The threat launch detection system of claim 2 wherein the prism-coupled compound parabolic concentrator includes a prism formed from a material selected from the group consisting of silicon, germanium, plastic, and high-index of refraction glass.

4. The threat launch detection system of claim 2 wherein the prism-coupled compound parabolic concentrator has a field of view of approximately ninety degrees.

5. The threat launch detection system of claim 1 wherein each temporal threat detector comprises:

optics operable to receive incident radiation and to focus this radiation in a focal plane;

single sensor element positioned relative to the optics to receive radiation passing through optics;

a sensor array positioned in the focal plane to receive focused radiation from the optics.

6. The threat launch detection system of claim 5 wherein the single element sensor is positioned adjoining the sensor array between the sensor array and the optics.

7. The threat launch detection system of claim 5 wherein the single element sensor is positioned between the sensor array and the optics at a distance that is less than a distance of the focal plane from the optics.

8. The threat launch detection system of claim 1 wherein the processing circuit includes a temporal template for each short-burn threat to be detected, and wherein the processing circuit compares each detection signal to each of the templates and determines a short-burn threat exists when the detection signal approximately matches one of the temporal templates.

9. A threat launch detection system, comprising:

a plurality of temporal threat detectors, each temporal threat detector including a single sensing element operable to sense radiation from various types of short-burn threats that occur within a field of view of the detector and to generate a detection signal in response to the sensed radiation;

a plurality of bias and amplification circuits, each bias and amplification circuit coupled to a corresponding temporal threat detector and operable to bias and amplify the corresponding detection signal to develop a conditioned detection signal;

a multiplexing analog-to-digital converter coupled to each of the bias and amplification circuits to receive the corresponding conditioned detection signal, the converter operable to sequentially digitize each of the conditioned detection signals;

a plurality of sensor arrays, each sensor array operable to capture images of threats within a field of view of the array;

a fusion processing circuit coupled to the analog-to-digital converter and the sensor arrays, the fusion processing circuit analyze the detection signals from each temporal threat detector as a function of time to detect the occurrence of a short-burn threat within the field of view of any of the temporal threat detectors and thereafter operable to process images from one or more of the sensor arrays having fields of view that overlap the field of view of the temporal threat detector that sensed the short-burn threat, the circuit processing the images to more precisely identify a location of the detected threat; and

a countermeasure controller coupled to the fusion processing circuit, the controller operable to implement countermeasures in response to the location and type of detected threat.

10. The threat launch detection system of claim 9 wherein the fusion processing circuit is further operable in response to detecting a short-burn threat to assign a timestamp, type indicator, and identifier to the detected threat.

11. The threat launch detection system of claim 10 wherein the fusion processing circuit is operable to process images from one or more of the sensor arrays by comparing two images from the appropriate sensor array that were captured nearest in time to the timestamp parameter assigned to the detected threat.

12. The threat launch detection system of claim 9 wherein each temporal threat detector comprises a prism-coupled compound parabolic concentrator.

13. The threat launch detection system of claim 12 wherein the prism-coupled compound parabolic concentrator includes a prism formed from a material selected from the group consisting of silicon, germanium, plastic, and high-index of refraction glass.

14. The threat launch detection system of claim 9,

wherein each temporal threat detector comprises:

optics operable to receive incident radiation and to focus this radiation in a focal plane;

single sensor element positioned relative to the optics to receive radiation passing through optics;

one of the sensor arrays positioned in the focal plane to receive focused radiation from the optics; and

wherein the fusion processing circuit further includes a staring array processor for processing the images captured from the sensor arrays.

15. The threat launch detection system of claim 14 wherein the single element sensor is positioned either adjoining the sensor array between the sensor array and the optics or between the sensor array and the optics at a distance that is less than a distance of the focal plane from the optics.

16. A method of detecting short-burn threats, comprising:

sensing radiation within a field of view;

generating a single detection signal in response to the sensed radiation; and

analyzing the detection signal as a function of time; and

detecting from the analysis whether the signal indicates a short-burn threat has occurred within the field of view.

17. The method of claim 16 wherein analyzing the detection signal as a function of time comprises:

comparing the detection signal to a plurality of temporal templates, each temporal template being associated with a particular type of short-burn threat; and

determining a short-burn threat exists when the detection signal approximately matches one of the temporal templates.

18. The method of claim 16 further comprising:

capturing images of the field of view being sensed; and

when the operation of determining indicates a short-burn threat exists, analyzing the captured images to identify more specifically a location of the threat.

19. The method of claim 16 further comprising taking countermeasures in response to detecting a short-burn threat.

20. The method of claim 16 wherein the types of short-burn threats detecting include tank shells and rocket-propelled grenades.